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I. INTRODUCTION[1]

Since the late 1960s, U.S. economic policymakers have been confronted by a succession of major challenges — forecasts of global food shortages, energy crisis and great inflation. Now the competitiveness challenge has emerged. As in the past we will cope; however, how effectively and wisely we cope will importantly affect the real incomes and quality of life our citizens enjoy.

The objective of this Paper is to examine the key sources of the competitiveness challenge confronting the United States and its implications for public policy. Given the focus of this conference, where appropriate, parallel observations about Canada are made.

In conducting such an examination, two points bear mentioning. First, the competitiveness challenge did not suddenly emerge. It is the result of fundamental structural trends in the U.S. and international economies that have been building for several decades. Part II begins with a brief background sketch of some of these key developments.

Second, we need to state what we mean by "competitiveness," because this term means different things to different people. Corporate managers and labor union officials naturally see the issue in terms of their successes and failures in penetrating foreign markets, competing with imports, and maintaining profits, employment and wages as the scope of international competition has broadened. In contrast, many professional economists anchor their views in classical and emerging theoretical concepts of comparative advantage, and see many of the adjustments imposed by markets as part of the natural process of economic change or the consequence of poorly conceived macroeconomic policies and misaligned exchange rates. Part II concludes with a discussion of these issues.

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† This Paper was last revised in June 1988. The author wishes to thank John Mutti for providing the production data in Table 7.

[1] This Paper is based on two more detailed studies prepared for the National Planning Association by this author: MEETING THE COMPETITIVE CHALLENGE: CANADA AND THE UNITED STATES IN THE GLOBAL ECONOMY (1988) [hereinafter THE COMPETITIVE CHALLENGE]; REASSESSING AMERICAN COMPETITIVENESS (1988).

II. DEFINING THE ISSUE

A. Some Background

During the early post-war years, the United States enjoyed an unusual position among advanced industrial countries ("AICs") in at least two important respects. First, by today's standards it was not dependent on foreign trade — in 1950, exports plus imports were only 8% of U.S. GNP as compared to 47% and 45% for Canada and Great Britain, respectively. Second, spared wartime destruction, the United States appeared to enjoy a competitive edge in virtually every industrial activity. The products of its farms, mines and factories were in critical demand to help rebuild Europe and Japan. Under the Bretton Woods system, the United States ran persistent trade surpluses and undertook foreign investments exceeding those surpluses, supplying dollars abroad that facilitated the expansion of world trade.

By the 1960s, the European economies had substantially recovered. Coupled with the additional efficiencies achieved through the formation of the European Community, this gave rise to spirited, though not truly threatening, competition for the United States. However, during this decade other profound changes emerged in the competitive environment confronting North America and Western Europe. Japan, followed by the newly industrializing countries ("NICs"), became a major exporter in a succession of labor-intensive products — e.g., textiles and footwear — and then in capital-intensive goods — e.g., steel and automotive products. These new cheaper sources of supply imposed heavy adjustment costs on firms and workers in mature U.S. industries. While employment expanded in some industrial activities and services, U.S. employment declined significantly in industries such as steel, automobiles, textiles and footwear.

As U.S. imports of manufactures and payments for foreign oil increased, U.S. reliance on exports to pay for them grew. From 1950 to 1969, U.S. exports rose only from 5% to 6% of GNP. By 1979, this figure had jumped to 12%; the U.S. economy had been internationalized. American consumers had acquired a taste for imports, and U.S. success in foreign markets would be required to pay for them.

Through the 1970s and early 1980s, an expectation emerged among many policymakers and economists that the United States could pay for growing imports of manufactures and oil by emphasizing its comparative advantage in agriculture, high technology and services. Economic theory predicted that increased specialization through trade would improve efficiency, the basis for rising incomes; and officials in both democratic and republican administrations continued to champion liberal trade policies and the GATT process. However, domestic economic adjustments proved more difficult than anticipated because of developments both abroad and at home that diminished above mentioned U.S. comparative

advantages and made the redeployment of labor and capital more difficult.

In agriculture, technological breakthroughs and more market-oriented policies assisting rural development have increased productivity in middle-income developing countries, reducing the potential scope for U.S. exports. In high-technology manufactures, enhanced research and development ("R&D") and innovative capabilities in Japan and some European countries have reduced U.S. technological leads in many areas. In services, industrial progress in Japan and the NICs has been accompanied by growing capabilities in exportable services, and foreign barriers to U.S. exports have proven difficult to remove.

Domestically, productivity growth slowed dramatically throughout the economy. Employment and real wages in manufacturing stagnated, and real wages elsewhere in the economy actually declined. From 1973 to 1986, employment expanded in only five of twenty two-digit SIC manufacturing sectors—machinery, electrical equipment, transportation equipment, instruments, and printing and publishing. Slow growing manufacturing employment has become part of the natural process of change in AICs, with foreign competition generally being only a partial factor. However, many U.S. manufacturing workers displaced by changes in technology, consumers' tastes or imports encountered difficulties finding other comparable paying jobs, and worker adjustment and retraining programs proved inadequate. Organized labor and business were successful in obtaining at least some protection in many mature industries where imports were an important factor — e.g., textiles, footwear, steel, and automobiles.

Beginning in the 1980s, the consequences of these structural trends were exacerbated by ill-conceived fiscal policies. From 1981 to 1986, the federal budget deficit increased more than threefold, exhausting domestic savings and requiring large foreign capital inflows. From 1980 to 1985, the real effective exchange rate for the dollar rose 45%,[2] and the current account deficit reached $117 billion in 1985 and $150 billion in 1987. Capital inflows permitted the combined growth in U.S. public consumption (most notably the increase in defense spending) and private consumption (more consumer spending financed through lower savings and federal tax cuts) to exceed growth in domestic production. Despite slow growing U.S. productivity, Americans were able to enjoy more of both guns and butter.

The fruits of this false prosperity were spread unevenly. Export opportunities, employment and profits were constrained in agriculture, high-technology manufacturing and tradeable services, and the adjustments imposed by rising imports were intensified in resource-based in-

[2] The Morgan Guaranty real (inflation-adjusted) index against 40 other currencies rose from an average of 90.5 in 1980 to a peak of 131.5 in February 1985: in September 1985, it was 122.6 and in May 1988, it was 89.5.

dustries and mature manufacturing. This accelerated the shift in employment to nontradable services.

For Canada, the effects of a strong U.S. dollar were significant. From 1981 to 1985, the Canadian dollar fell 12% against the U.S. dollar, but it also rose with the U.S. dollar against European currencies and, initially, against the yen. As a consequence, while Canada's current account and merchandise trade balances with the United States improved, they deteriorated and became negative with other countries.

Table 1: Canadian Exchange Rate Indices and Current Accounts, 1981-1985

	Index of Canadian $			Can. Current Account W/...			
	U.S.$	Ger. DM (1981=100)	Yen	Total	U.S.	All Other (Bil. Can. $)	U.S. Share of Can. Exports (percent)
1981	1.00	1.00	1.00	−6.1	−7.9	1.8	66
1982	.97	1.05	1.10	2.8	−1.7	4.5	69
1983	.97	1.10	1.05	3.1	2.6	0.5	73
1984	.93	1.17	1.00	3.4	7.2	−3.8	76
1985	.88	1.14	.95	−1.2	8.6	−9.8	79

Source: BANK OF CAN. REV. (various issues).

During this period, the portion of Canadian exports purchased by the United States rose from 66% to 79%. While Canadian dependence on U.S. markets was growing, Canada's weaker dollar fueled misplaced concerns in Congress that Canada was enjoying an unfair advantage.

Early in 1985, the consequences of the growing U.S. debt began to affect market psychology, and from February to September the real effective exchange rate of the U.S. dollar fell about 7%. Following the September Plaza Agreement, the U.S. dollar began a more rapid decline. By the end of 1987, the real effective exchange rate for the dollar had fallen to its 1980 level, but current account and trade deficits persisted. The key questions now are: Has the U.S. dollar fallen far enough to redress trade imbalances? If not, how much further will it have to fall? What adjustments are required in Japanese and European economic performance and can they be achieved? Can substantial reductions be achieved and sustained in the U.S. current account deficit without further cuts in the federal budget deficit and better U.S. savings performance? These issues are complicated by the fact that while the U.S. dollar has fallen greatly against the mark and the yen, it has not moved nearly as much against the important East Asian NICs. These countries account for one-fifth of the U.S. trade deficit, and they are rapidly expanding their industrial capabilities to include a wider range of more sophisticated products.

What can be said is that U.S. current account deficits are not likely to relent without both further reductions in U.S. budget deficits and

faster growth in Japan and Europe, or a deep recession. However, foreigners will not be willing to accumulate rapidly increasing amounts of U.S. dollar-denominated assets indefinitely, and at some point the United States will have to service its external debt. Fewer imports, more exports, and lower levels of U.S. consumption will be required in the 1990s to pay for the spending spree of the 1980s.[3]

This line of discussion, while useful and important, can distract attention from the deepening structural problems noted above that strongly affect what Americans will produce and export, and the incomes they will earn after current account and international financial imbalances are corrected.

B. Defining Competitiveness

Both economists and practitioners discuss competitiveness at two levels: the national or macro level (current accounts, comparative wage rates and living standards, government deficits, savings and investment, and international capital flows) and the industry or micro level (the net import and export positions of individual sectors of the economy). In this context, one of the most interesting comparisons is that between market-oriented economists and private-sector leaders.

Market-oriented economists see the macro side of the issue as largely a problem of restoring the current account equilibrium by correcting inconsistencies among U.S., European and Japanese monetary and fiscal policies, and perhaps by reforming the exchange rate system. At the industry level, the primary focus is on explaining why some U.S. industries are exporters and some are importers. In terms of public policy, the principal recommendations are trade liberalization and efforts to promote adjustment and more open and efficient markets generally. Viewed with some skepticism are industrial policies intended to "restore competitiveness" when individual industries or activities are uncompetitive because of lagging investment or disequilibrium of labor and other resource costs.

In contrast, tempered by the events of the last two decades, many business and labor leaders are inclined to define the issue more broadly. To them, competitiveness goes beyond the problem of reducing merchandise trade and current account deficits, and accepting the patterns of international trade and specialization that would follow. They would include in their definition: (1) the impact of balancing export and import growth on the progress of profits, real wages and employment opportunities: and (2) how U.S. and foreign government policies can affect market outcomes. For example, the President's 1985 Commission on Industrial Competitiveness defined competitiveness as: "the degree to which a na-

[3] Continued economic growth will permit higher consumption levels in the 1990s than in the 1980s, but lower levels than would have been possible had the United States not borrowed abroad during the 1980s.

tion, under free and fair market conditions, produces goods and services that meet *the test of international markets* while simultaneously maintaining and *expanding the real incomes* of its citizens. (emphasis added)" Endorsing this definition, the Council on Competitiveness stated:

> The recent decline of the dollar will help U.S. producers compete. So will an aggressive trade policy that promotes U.S. commercial interests at home and abroad. It is critical to understand, however, that competitiveness is not simply the ability to sell abroad or to maintain a sustainable trade position at some exchange rate. The very poorest nations often boost exports just by significantly devaluing their currencies. The consequences, however, are sharp declines in relative wages and relative standards of living — a high price to pay. The complexity and severity of the problem require the United States to focus on both macroeconomic and structural solutions. Productivity growth, technological innovation, the quality and design of products, and an educated and motivated work force are all critical to enhanced competitiveness.

By taking such an approach, private-sector leaders broaden the subject to include the economics of growth, its determinants (e.g., rates of savings, investment and R&D, and the quality of education), and the distribution of its benefits, as well as structural issues like worker adjustment and the organization of companies and the workplace.

For market-oriented economists, the impacts of international trade on growth and income distribution have long been important areas of inquiry, as have the challenges of framing policies that encourage growth, assist workers displaced by imports or other change, and improve the effectiveness of industrial organization and labor-management relations. However, these economists draw a distinction between general policies that encourage growth throughout the economy and facilitate the smooth functioning of markets, on the one hand, and focused intervention that protects the incomes of selected firms and workers at the expense of greater efficiency and the general welfare of all citizens, on the other hand. Moreover, there is a danger that national policies championed as measures to improve competitiveness, broadly defined to include growth, jobs and incomes, can easily become veiled (or even rather obvious) instruments for protecting the interests of politically potent industries seeking to avoid the discipline of the marketplace. Hence, on the level of policy, market-oriented economists are inclined to separate discussions of competitiveness from consideration of general policy measures to improve growth and alter the distribution of its benefits.

Nevertheless, to be relevant to the policy process, economists are often required to broaden their approach to competitiveness to include the economics of growth, as well as how governments influence the evolution of comparative advantages. When economists choose to avoid this approach, they risk being ignored or, worse, leaving unchallenged poorly conceived policy prescriptions promoting the rent-seeking inter-

ests of politically potent firms and workers, which ultimately reduce the free flow of goods, efficiency and general public welfare. To positively influence policy, economists must analyze competitiveness in the same terms as the players in the economic and political processes.

This Paper seeks this broader perspective on the competitiveness issue. Part III focuses on macro or national competitiveness, accepting as a starting point the definition of this concept offered by the President's Commission, and evaluates U.S. and Canadian performance in terms of it. Parts IV and V focus on industry issues ("comparative advantages" in the jargon of economists). Part VI is reserved for some conclusions.

III. National Competitiveness

The definition of competitiveness offered by the President's Commission is a useful point of departure if we keep in mind: the test of international markets boils down to the American ability to make products that compete in both price and quality; and the progress of real incomes is difficult to judge without comparison to historical standards or progress in other major AICs, and rising domestic living standards do not reflect improved competitiveness if they are temporary, e.g., generated through unsustainable foreign borrowing.

U.S. productivity growth is the most reliable indicator of the U.S. long-term ability to produce internationally marketable products and maintain and expand real incomes. Ultimately, we can increase consumption more rapidly than we increase production only by borrowing from foreigners and only as long as they are willing to let us pile up debt.

A. Productivity Performance and Real Wages

From the late 1940s to the late 1960s, U.S. private sector output per worker and real wages increased at average annual rates of 2.7% and 2.4%, respectively.

From 1967 to 1973, U.S. productivity growth in the private sector slowed to about 1.4% a year and then fell to 0.5% from 1973 to 1987. This was reflected in the progress of real wages, which slowed to 1.7% a year from 1967 to 1973 and then became negative. Productivity performance was somewhat better in the manufacturing sector; however, even there compensation declined after 1973, reflecting wage patterns throughout the rest of the economy.

Table 2: Average Annual U.S. Productivity and Wage Growth, 1949-86

	Private Economy		Manufacturing	
	Productivity	Real Wages	Productivity	Real Wages
1949-67	2.7%	2.4%	2.8%	2.5%
1967-73	1.4	1.7	3.3	1.4
1973-87	0.5	−0.7	2.5	−0.4

Sources: NPA DATA SERVICES, NATIONAL ECONOMIC PROJECTIONS; ECONOMIC REPORT OF THE PRESIDENT (Jan. 1988).

From 1973 to 1986, the erosion in real wages occurred in virtually every major sector: construction, manufacturing, transportation and public utilities, wholesale trade, retail trade, finance, insurance and real estate, and other services. Mining was the only exception.

In Canada, productivity growth also slowed significantly after 1973. The progress of real wages in the private economy declined from more than 4% a year from 1949 to 1973 to less than 2% a year from 1973 to 1986.

B. International Comparisons

1. Productivity

From the late 1940s to the early 1970s, progress in both productivity and wages was much faster in Japan and Europe than in North America, as industries abroad benefited greatly from the rebuilding of their plants and public infrastructures. After 1973, productivity growth slowed in all the major AICs, but the problem was most severe in the United States, followed by Canada.

Table 3: Average Annual Productivity Growth by Sectors, 1973-85

	Total Economy	Agriculture	Industry	Manufacturing	Services
United States	0.6	2.7	1.1	2.2	0.3
Canada	1.2	0.7	0.8	1.2	1.6
Japan	3.0	2.0	4.0	5.7	1.8
Germany	2.1	4.2	2.5	2.8	1.7
EC	1.9	4.6	2.6	2.8	1.0

Source: OECD, HISTORICAL STATISTICS 1960-85 (1987).

Comparing absolute levels of productivity is much more difficult than comparing growth rates. Focusing on manufacturing, where comparative estimates are available, the U.S. productivity lead has been substantially reduced and several OECD countries appear now to surpass Canada.

Table 4: Comparative Levels of Manufacturing Productivity (United States = 100)

	1950	1960	1973	1986
United States	100	100	100	100
Canada	52	63	73	69
Japan	11	22	52	84
Germany	34	58	79	91
France	29	39	56	72
United Kingdom	33	34	37	40

Sources: D. DALY & D. MACCHARLES, CANADIAN MANUFACTURED EXPORTS: CONSTRAINTS AND OPPORTUNITIES (1986); BUREAU OF LAB. STATISTICS; AUTHOR'S ESTIMATES.

During the early post-war decades, better productivity performance in Japan and Europe was expected, but more recently, continued poorer performance in North America has become a major focus of concern. Several factors have been important.

First, as a result of the baby boom and continued immigration, the United States and Canada have absorbed many more workers into the labor force than other countries. A large portion have been young and hence less experienced (see Figure 1). Moreover, declining education standards have accentuated the effects of this trend.

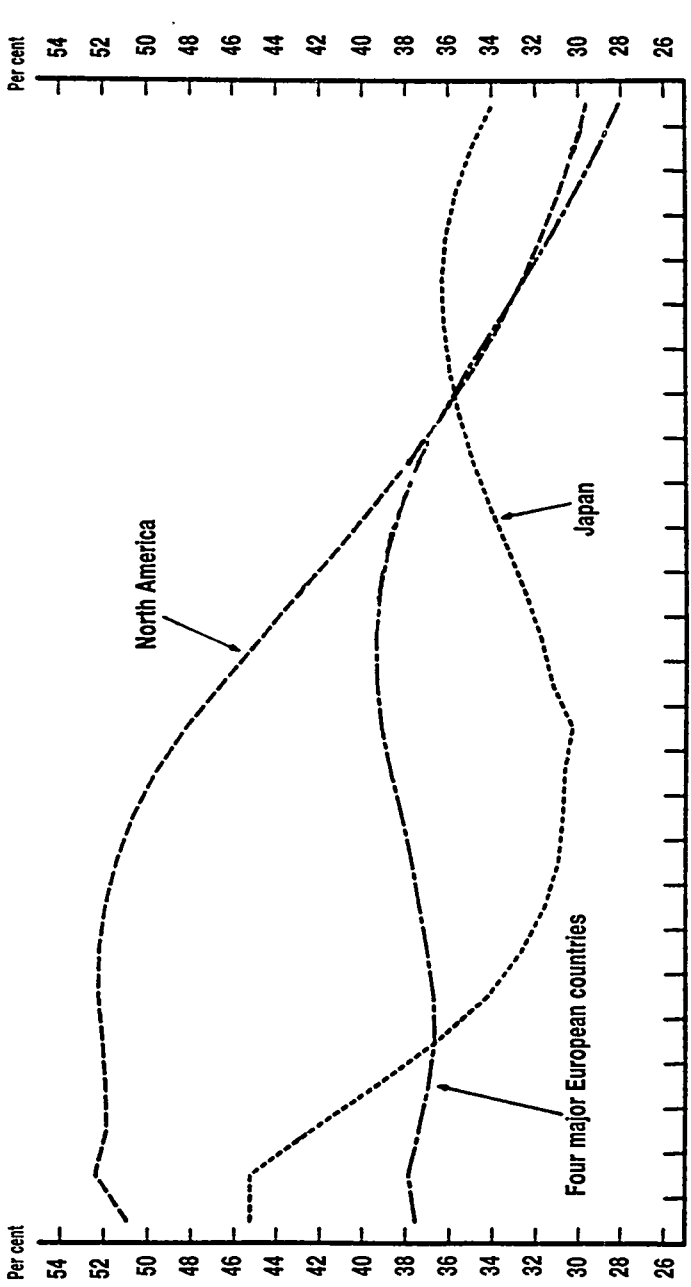
Second, the U.S. and Canadian investments in machinery and equipment have been lower than in Japan and about the same as in Europe. With manufacturing employment staying roughly constant in the United States, Canada and Japan and falling in Europe, the amount of capital available to workers in manufacturing has advanced more slowly in North America than in Japan and Europe.

Third, productivity is importantly affected by how effectively labor, capital and other resources are organized and managed, the climate for labor-management cooperation, and the emphasis attached to quality control. This nexus is often called the "soft" side of the productivity equation. Excellence in these areas depends on the effective application of modern, scientific management practices, as well as changes in both corporate structures and human resource management necessary to implement new technologies effectively.

During the early 1980s, many observers attributed much importance to management practices in explaining the Japanese ability to rapidly cut

Figure 1

Youth Demographic Pressures on the Labor Force, 1970-95*



* The vertical axis shows the youth population aged between 15 and 24 years divided by the "prime-aged" population between 25 and 54 years.

Source: OECD OUTLOOK 29 (Dec. 1986). Reprinted by permission.

costs and improve quality.[4] In the past several years, U.S. companies have paid more attention to the potential for nonhardware productivity improvements, adopting Japanese practices such as just-in-time inventory, work teams and quality circles, and trimming central management and staff. During the recent recovery, this has been reflected in a U.S. (but not Canadian) improvement in manufacturing productivity growth without an increase in U.S. share of GNP devoted to investment. In fact, since 1979, U.S. progress in productivity has moved ahead of Europe, but still lags behind Japan.

Table 5: Manufacturing Investment and Productivity

	Machinery and Equipment Investment as a Share of GDP		Average Annual Manufacturing Productivity Growth	
	1979/1973	1985/1979	1979/1973	1985/1979
United States	8.0%	8.0%	0.9%	3.5%
Canada	7.7	7.4	1.0	1.3
Japan	10.8	10.2	5.0	6.3
Germany	7.9	8.2	3.1	2.4
EC	8.5	8.2	2.7	2.9

Source: OECD, HISTORICAL STATISTICS 1960-85 (1987).

However, even if U.S. companies have caught up with their Japanese competitors in many management areas, can U.S. manufacturing continue its improved productivity performance without increasing the share of GDP devoted to investment? On the positive side, fewer young people are now entering the North American labor force. Over the next decade, the portion of mature workers in the North American labor force will rise, while Japan will experience more youth employment pressures. Conversely, an emerging challenge is the difficulty U.S. companies are experiencing in obtaining the same results from new manufacturing technologies (e.g., computer-aided manufacturing) as competitors in Japan and Europe. These technologies often require further changes in corporate organizations and human-resources management to be effectively implemented. These issues are discussed in Part V.

[4] Among examples frequently cited was the $2,000 Japanese cost advantage in subcompact cars estimated for the 1983 model year. While exchange rates may affect the absolute size of such estimates, the distribution of this advantage, which is not generally influenced by currency values, was revealing. Only 23% was attributed to lower wages or better production techniques, while 63% arose from better management systems (e.g., "Just-in-Time" inventory) and 8% from better labor-management relations. *See* P. MORICI, THE GLOBAL COMPETITIVE STRUGGLE: CHALLENGES TO THE UNITED STATES AND CANADA 17 (1984).

2. Role of Exchange Rates

Slower U.S. and Canadian productivity growth will reduce cost competitiveness in export and import-competing industries if it is not accompanied by exchange rate depreciation, *ceteris paribus*. With flexible exchange rates, the foreign currency values of U.S. and Canadian dollars might be expected to fall against Asian and European currencies to compensate for lower North American productivity growth, restoring U.S. and Canadian cost competitiveness. However, these adjustments will be achieved at the expense of U.S. and Canadian wages growing more slowly than, and falling relative to, wages in Europe and Asia.[5]

3. Impact of Lagging Productivity on Relative Living Standards

Again focusing on manufacturing, the important progress achieved by Japan and Europe in reducing the North American productivity lead has been reflected in the wages earned by their workers. From 1950 to 1973, hourly wages in Japan, Germany and France rose from 7%, 21% and 26% of U.S. levels to 42%, 89% and 59%. By 1973, German wages had surpassed Canadian levels (see Table 6).

With the advent of flexible exchange rates in 1973, currency values generally adjusted for slower U.S. and Canadian productivity growth until the U.S. dollar began to rise after 1980. By 1980, German wage levels exceeded both U.S. and Canadian levels, while Japanese wages continued to lag. By 1985, the appreciation of the U.S. and Canadian dollars against other currencies raised U.S. and Canadian wages above compensation elsewhere. However, with the decline of the U.S. and Canadian dollars, by 1987 North American manufacturing workers again fell behind workers in Germany, and the were not much ahead of workers in France and Japan. Large U.S. current account deficits experienced after 1983 indicate that 1987 and 1988 wage comparisons are much closer to sustainable levels than were 1985 levels. When defined in terms of productivity growth and the progress of sustainable real incomes, U.S. and Canadian national competitiveness has declined relative to progress elsewhere.

[5] If the value of the U.S. dollar is artificially maintained at high levels through foreign borrowing, as it was from 1982-85, these adjustments in relative living standards can be avoided during the period of overvaluation.

Table 6: Comparative Compensation Levels in Manufacturing

	1950	1973	1980	1985	1987	1988 (1st Qtr.)
United States	100	100	100	100	100	100
Canada	63	86	86	84	89	93
Japan	7	42	57	50	84	95
Germany	21	89	125	7	125	134
France	26	59	91	58	92	98
United Kingdom	26	40	76	48	67	73

Source: D. DALY & D. MACCHARLES, CANADIAN MANUFACTURED EXPORTS: CONSTRAINTS AND OPPORTUNITIES (1986); D. DALY & D. MACCHARLES, FOCUS ON REAL WAGE UNEMPLOYMENT (1986); BUREAU OF LAB. STATISTICS; author's estimates.

With U.S., Canadian, Japanese, and European productivity and wages converging, North American productivity performance must match Japanese and European progress for North American living standards to keep up with living standards elsewhere.

IV. INDUSTRY COMPETITIVENESS

Productivity growth tells us much about the long-term prospects for national competitiveness—the ability to balance current accounts and to maintain and expand real incomes. However, in the long run, a country cannot be a net exporter of all goods and services. A nation's industry or comparative competitiveness may be defined in terms of those products it tends to export or import under cyclically balanced current accounts.[6] Such comparative competitiveness is determined by the interaction of (1) structural factors (domestic supply and demand conditions) that determine what economists call comparative advantages; and (2) government policies that can alter market prices and hence patterns of domestic production, consumption and trade — e.g., tariffs and nontariff barriers, exchange rate regimes, and industrial policies.

Regarding structural factors, the weight of international economic research indicates that the availability, and hence relative costs, of various types of skilled labor, physical capital and R&D capital most importantly affect industry competitiveness. The United States has traditionally enjoyed export strength in agricultural products and knowledge-intensive (technology-intensive) goods and services requiring large commitments of R&D and highly-skilled labor, and to a lesser extent some products requiring large amounts of physical capital.[7] As noted

[6] More rigorously stated, under current account equilibrium. Apart from cyclical disturbances in current accounts, some countries are expected to be capital exporters and others to be capital importers over the long run principally because of national differences in savings rates and productivity of capital.

[7] Focusing on manufacturing, broadly defined to include processing natural resources, international economists have undertaken a variety of empirical studies (e.g., input-output, correlation and

above, when import bills rose for oil and manufactures such as apparel, footwear, steel, and automobiles during the 1970s and early 1980s, an expectation emerged that the United States could pay its way with growing exports and agricultural products, knowledge-intensive services and high-technology manufactures. This has proved difficult.

A. Agriculture

During the early 1970s, substantial increases in world grain prices and in sales to the Soviet Union gave rise to optimism about the role agricultural products could play in expanding U.S. exports. From 1972 to 1973, grain prices and export volumes increased dramatically; agriculture's contribution to total U.S. merchandise exports jumped from 18% to 25%. Subsequently this share declined to 19% in 1980 and 12% in 1987.

U.S. farmers have lost international market shares because of changing supply conditions and government policies abroad and at home. On the supply side, genetically-based improvements in agricultural technology have increased productivity in many middle-income developing countries. Focusing on policy, many of these countries have moderated development strategies that systematically penalized farming to promote industry. These developments combine to reduce the demand for basic commodities in international markets (e.g., Indonesia, once a large importer of rice, is now self-sufficient).

The consequences of these trends have been exacerbated by misguided government policies in the AICs. The EC subsidizes exports, artificially elevating global supplies; Japan restricts market access, artificially suppressing international demand. Both sets of policies depress international prices and limit U.S. export opportunities. Moreover, during the 1980s, U.S. support prices (both target and loan rates) for grains and oil seeds generally have been above world prices, critically

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regression tests) to test the extent to which differences in the competitive performance of various U.S. industries (as well as manufacturing in other countries) is related to how much R&D they undertake, how much skilled versus unskilled labor they use, and the amount of capital per worker they employ. *See generally* Baldwin, *Determinants of Trade and Foreign Investment: Further Evidence*, 61 REV. OF ECON. & STATISTICS 40-48 (1979); Leamer, *The Commodity Composition of International Trade in Manufactures: An Empirical Analysis*, 82 OXFORD ECON. PAPERS 350-74 (1974); Stern, *Testing Trade Theories*, in INTERNATIONAL TRADE AND FINANCE: FRONTIERS FOR RESEARCH 3-49 (P. Kenen ed. 1975); Stern & Maskus, *Determinants of the Structure of U.S. Foreign Trade, 1958-1976*, 11 J. INT'L ECON. 207-24 (1981). These articles indicate that U.S. export competitiveness is highly concentrated among R&D and *human* capital-intensive (skilled labor-intensive) activities, and U.S. imports have been concentrated in products requiring large amounts of less-skilled labor. The role of *physical* capital is more ambiguous, because its use is highly correlated with the use of natural resources; for example, nonferrous metal smelting is extraordinarily capital-intensive. When resource-intensive manufacturers are included in the sample of industries studied, U.S. imports tend to be correlated with the intense use of capital in addition to R&D and human capital. When these industries are removed from the sample, U.S. exports appear to be more capital-intensive than imports, but this is a weak relationship.

reducing U.S. export potential in a tougher competitive environment, and forcing the United States to resort to costly export subsidy programs.

It is important to remember that the United States is generally a residual supplier to foreign markets of many of its export commodities — wheat, corn, other grains, rice, soybeans, and cotton. During the 1970s, agricultural production and consumption outside the United States grew about 2.2% and 2.7% a year, respectively, creating a favorable environment for U.S. exports. However, during the 1980s, foreign production has been rising 2.6% a year, while growth in consumption has dropped sharply.[8]

B. Services

Essentially, U.S. private-sector current account receipts (exports) are generated by merchandise exports; investment income received from U.S. foreign affiliates (foreign branches) and U.S. holding of foreign equities, bonds and bank deposits; and service exports. The latter include: (1) travel — sales to foreigners in the United States (sales to tourists of food, lodging, entertainment, health, and educational services); (2) passenger fares and other transportation — payments for shipments of goods by air, sea, rail, highway, or pipeline; (3) fees and royalties — payments for patents, trademarks, copyrights; and (4) private business services — payment for management, technical and professional services, such as insurance, communications, and engineering services. Since the early 1970s, these have accounted for 15% or less of U.S. exports. Travel and transportation account for the majority of these receipts, about 9% of U.S. exports in 1987; private business services and fees and royalties contributed only about 3% and 2%, respectively.

Growth in private business service exports is constrained by trade barriers not generally covered by the GATT. These barriers often emerge from seemingly benign differences in the ways national governments regulate their service industries, but they sometimes reflect intended discrimination. Barriers to trade in business services will be more difficult to eliminate than barriers to trade in goods. Solutions will require major and complicated changes in domestic regulatory practices and legislation, and concessions on matters relating to foreign investment — right of establishment and national treatment — owing to the needs of many service firms to establish offices and subsidiaries abroad to export effectively. Services are on the agenda for the Uruguay Round, but progress will be slow.

It is important to remember that many of the factors contributing to competitiveness in high-technology manufacturing activities are also important to competitiveness in many business services and receipts for fees and royalties. For example, investments in R&D are critical to ex-

[8] Address by Robert L. Thompson, *Agriculture in the Uruguay Round*, Nat'l Bureau for Econ. Research, Meeting on Trade Issues in the Uruguay Round, in Washington D.C. (May 29, 1987).

panding exports of consulting services that accompany high-technology goods and for generating royalties on U.S. patents. As discussed below, R&D is an important area where other AICs are expanding their efforts more rapidly than the United States. From 1973 to 1983, the U.S. share of OECD receipts for patents, royalties, licenses and similar payments declined from 66% to 59%; meanwhile Japan, West Germany, France, and Canada increased their market shares from 4%, 4%, 6% and 1% respectively to 9%, 5%, 8% and 2%.[9]

C. *High Technology*

Until the dollar began appreciating in 1981, growing U.S. trade surpluses in R&D-intensive goods (shown in Figure 2-a) as well as R&D-intensive industries' increasing share of U.S. manufacturing value added, employment and investment, were interpreted as important evidence of an improving U.S. comparative advantage in high technology.[10] However, growing trade surpluses may reflect the effects of inflation and economic growth as much as an improving competitive position, and rapid growth of value-added employment and investment in these U.S. industries does not necessarily indicate an improving competitive position if these activities are also growing rapidly in other AICs.

Focusing on the trade data, to remove the effects of inflation and growth these trade balances should be normalized. One way to do this is to divide these annual balances by the total value of R&D-intensive exports and imports. These data are charted in Figure 2-b and indicate U.S. competitiveness was declining before the dollar began appreciating.[11]

Furthermore, it has been found that technology-intensive industries are growing rapidly in other AICs as well as the United States.[12]

Table 7: Shares of Manufacturing Value Added: Technology-Intensive Sectors

	U.S.	Japan	France	Germany	U.K.	Canada
1969	44%	40%	34%	41%	39%	30%
1981	47	54	41	46	43	32
1985	47	60	42	49	44	32

Source: MUTTI, *supra* note 12; THE COMPETITIVE CHALLENGE, *supra* note 1.

These industries expanded most in Japan and France, two countries that have improved their trade competitiveness vis-à-vis the United States,

[9] S. WOODS, WESTERN EUROPE: TECHNOLOGY AND THE FUTURE (1987).

[10] R. LAWRENCE, CAN AMERICA COMPETE? (1984).

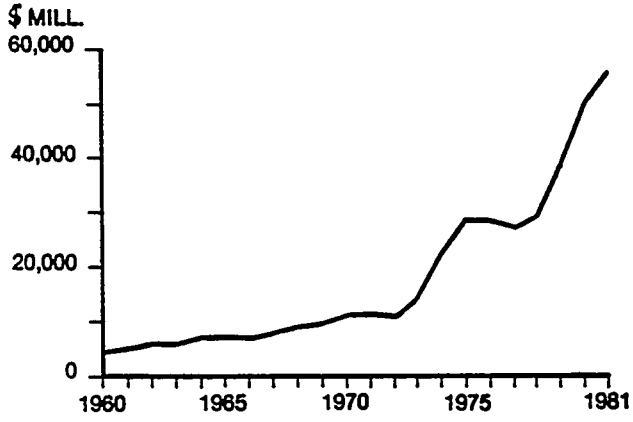
[11] An alternative normalized measure of competitiveness is exports divided by imports; this index also reveals declining U.S. competitiveness.

[12] J. MUTTI & P. MORICI, CHANGING PATTERNS OF U.S. INDUSTRIAL ACTIVITY AND COMPARATIVE ADVANTAGE (1983).

Figure 2

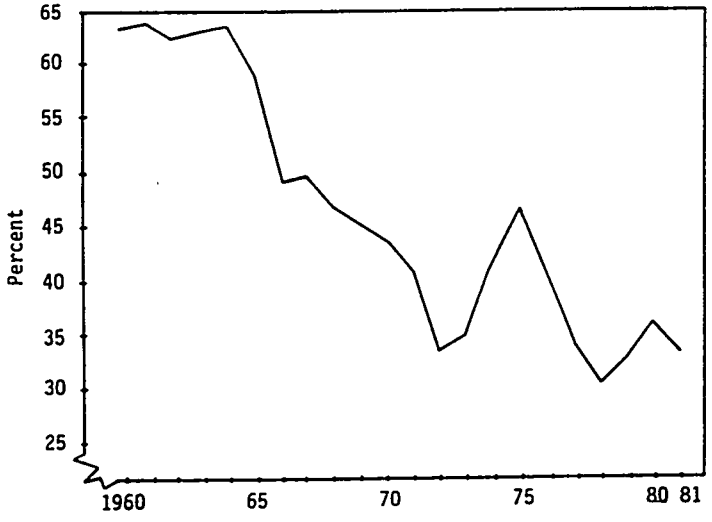
A.

U.S. TRADE BALANCE IN R&D-INTENSIVE MANUFACTURES, 1960–80



B.

U.S. TRADE BALANCE IN R&D-INTENSIVE PRODUCTS DIVIDED BY R&D-INTENSIVE EXPORTS PLUS IMPORTS, 1960–81



Source: NAT'L SCI. FOUND., TWENTY-SIXTH ANNUAL REPORT OF THE PRESIDENT OF THE UNITED STATES ON THE TRADE AGREEMENTS PROGRAM: 1981-1982 (Nov. 18, 1982).

and in Germany, the country that still enjoys the strongest high-technology trade performance among major European AICs.[13]

Table 8: International Competitiveness in Technology-Intensive Sectors (Export-Import Ratios)

	U.S.	Japan	France	Germany	U.K.	Canada
1969	1.78	3.41	1.13	3.04	3.16	0.78
1981	1.56	7.38	1.24	2.42	1.43	0.82
1985	0.75	6.67	1.22	2.19	1.04	0.81

Source: MUTTI, *supra* note 12; THE COMPETITIVE CHALLENGE, *supra* note 1.

Studying other trade data, these basic conclusions have been supported.[14] For example, Hatter found that:

> Although the United States remains by far the leading exporter of high-technology manufactures, the decline in our market share shows that other nations, particularly Japan, are increasingly competitive with the United States.
>
> Japan's share of the industrial countries' exports of high-technology products more than doubled between 1965 and 1982. . . . Japan dominates the export market for communications equipment and electronic components.[15]

Hatter's analysis is particularly useful because high-technology trade is defined more precisely than in other analyses.[16] Constrained by their effort to construct a consistent trade and value-added data set for six countries, the other authors studied rather broad industries. Hatter, analyzing only trade data, was able to comb more finely for R&D-intensive activities. Applying Hatter's data, we obtain the same results for directions of change in competitiveness.

Table 9: International Competitiveness in Hatter's High-Technology Industries (Export-Import Ratios)

	U.S.	Japan	France	Germany	U.K.	Canada
1970	2.14	2.36	0.94	1.69	1.38	0.65
1981	1.79	4.64	1.06	1.38	1.19	0.72
1984	1.10	5.12	1.21	1.41	1.00	0.74

Source: U.S. DEP'T OF COMM.

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[13] Declining trade performance through 1981 is a more reliable indicator of eroding U.S. competitiveness than observations for subsequent years. This was the last year the U.S. current account was near balance and unaffected by large federal budget deficits and a strong dollar.

[14] M. AHO & H. ROSEN, TRENDS IN TECHNOLOGY-INTENSIVE TRADE: WITH SPECIAL REFERENCE TO U.S. COMPETITIVENESS (1980); V. HATTER, U.S. HIGH TECHNOLOGY TRADE AND COMPETITIVENESS (1985).

[15] HATTER, *supra* note 14.

[16] *Compare id. with* MUTTI, *supra* note 12.

Why has U.S. competitive performance declined in high-technology manufactures and some knowledge-based services? Has it been caused by shifts in comparative advantages? Foreign targeting? Some combination of the two?

With respect to the evolution of the underlying determinants of U.S., Japanese and other AIC's comparative advantages, there is evidence that the United States enjoys a strong position in R&D-intensive activities but that its dominance is eroding. For example, the United States has the largest supply of research scientists and engineers, but Japan has been adding to its supply so rapidly that its capabilities are nearly equal to those of the United States. Other countries also have closed their gaps with the United States.

Table 10: Number of Scientists and Engineers per Ten Thousand in Labor Force

	1984	Average Annual Rate of Growth 1965 - 1984
U.S.	65	0.1%
Canada	30	2.4
Japan	62	5.0
Germany	49	4.1
France	41	3.6
U.K.	34	3.0

Source: NAT'L SCI. FOUND., OECD SCI. AND TECHNOLOGY INDICATORS DATABASE.

Moreover, as will be discussed in Part V, the heavy commitment of U.S. R&D resources to publicly-funded activities with limited commercial potential is becoming an area of concern.

Focusing on Japanese success, Saxonhouse,[17] using a general equilibrium model, concluded that Japan's trade patterns lie within those expected based on conventional concepts of comparative advantage, leaving one to conclude that MITI's efforts to orchestrate industrial development do not substantially affect this allocation of Japanese resources among broad categories of activity — e.g., labor-intensive, capital-intensive and technology-intensive manufactures, and tradeable services. Borrus and Zysman[18] challenged this, arguing Saxonhouse fails to explain why Japan, unlike other AICs, does not import much in the manufacturing industries in which it exports — Japan does not participate much in intraindustry trade, which has become important in trade among the

[17] Saxonhouse, *The Micro- and Macroeconomics of Foreign Sales to Japan*, in TRADE POLICY IN THE 1980's 259-304 (W. Cline ed. 1983); G. SAXONHOUSE, WHAT'S WRONG WITH JAPANESE TRADE STRUCTURE (1985).

[18] Borrus & Zysman, *Japan's Industrial Policy and Its Pattern of Trade*, in JAPAN'S ECONOMY AND TRADE WITH THE UNITED STATES 13-22 (Joint Econ. Committee, U.S. Congress ed. 1985).

other AICs. Mutti and Morici[19] argued that shifts in underlying comparative advantages are most important but that industrial policies have played some role.

Why all the disagreement? The answer may lie in the special characteristics that make some high-technology industries attractive targets for governments seeking to assist in the creation of competitive industries, such as steep learning curves in manufacturing process for goods with short product cycles (e.g., semiconductors), or cases where there is room for only a few competitors because of the size of required R&D investments (e.g., wide body commercial airliners).[20] There is evidence that targeting has adversely affected U.S. performance vis-à-vis some Japanese and European competitors. However, focusing on the distribution of resources throughout the economy, it is not at all clear that such targeting does not have most of its effect by reallocating Japanese and European resources within their high-technology sectors.[21] As such, this research does not dispel the basic notion that rapidly growing R&D capabilities abroad are playing the central role in the weakening of U.S. trade competitiveness in high technology. This provides little comfort for the U.S. companies that have been the victims of subsidized foreign competition, nor does it diminish their rights to seek relief under U.S. trade laws where possible and appropriate.

D. Outlook for U.S. Competitiveness

As a result of lagging U.S. productivity growth (and other factors listed in Part VI), the effective exchange rate for the dollar that could balance imports and exports, given an appropriate constellation of U.S., Japanese and European macro policies, is lower than a decade ago. If the U.S. current account is brought closer to a balanced position, the weaker dollar will require Americans to purchase fewer imported products.

For mature, import-competing industries, this improves opportunities in domestic markets. While the United States will continue to be a net importer in most areas, some exports may be expected. For example, the recent fall in the dollar helped Chrysler to again export cars from the

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19 MUTTI, *supra* note 12.

20 *See* Morici, *supra* note 1.

21 *Certeris paribus*, within an economy a bias in the overall system of taxes, subsidies and market regulations to encourage production in a few high-technology industries would be expected to have two sets of effects: (1) draw resources from other high-technology industries and from the nonhigh-technology sector to the favored industries; and (2) through effects on factor prices, encourage more rapid growth in the supply of high-technology specific resources, e.g., scientists and engineers. Hence we would expect targeting to encourage the high-technology sector to grow more rapidly than the nonhigh-technology sector, and favored high-technology industries to grow more rapidly than nonfavored industries. However, unless financial benefits are large and widespread among many high-technology industries, more of the impact on resource allocation should be within the high-technology sector than between that sector and the nonhigh-technology sector. Studies of the overall level of industrial financial incentives indicate these are higher in Japan than in the United States but lower than in other AICs.

United States. However, pressures to improve productivity in these industries mean that unemployment will continue to be a problem for communities dependent on these industries.

Agriculture, services and high technology will remain important in the U.S. export equation, but declining U.S. comparative advantages and obstacles to foreign sales within these sectors also portend increased opportunities for mature industries and manufacturing generally. Specifically, declining comparative advantages and restrained market opportunities in some sectors of the economy translate into improved comparative advantages (or at least reduced disadvantages) in others.

Together, these trends indicate that if the U.S. current account is to be brought closer to a balanced or surplus position in the late 1980s or early 1990s, the structure of U.S. exports and imports will look different than was anticipated in the 1970s. An improved current account will require a market-induced strengthening of mature manufacturing industries in addition to better performance from export-competing high-technology and services industries. All of this suggests a more balanced economy with a greater role for manufacturing, especially mature manufacturing activities, than was expected a few years ago.

E. Outlook for Canadian Industries

Historically Canada's competitive strengths have emanated from its resource endowments: grains, fish and food products, forest products, energy, and basic metals and minerals. However, prospects for continued growth in these areas is limited.

In agriculture, Canadian farmers face many of the same competitive challenges as their American counterparts: new sources of supply in developing countries and the effects of farm support programs on international markets in developed countries. In forest products, growth may be constrained by the adequacy of future timber supplies. For many metals and minerals, new technologies and substitute materials have reduced the demand for important Canadian exports (e.g., copper, zinc and lead) and new sources of supply have reduced many Canadian market shares. In energy, export prices for petroleum and natural gas are currently about one-half their 1981 level.

These trends have accentuated a secular decline in the contribution of natural resources to Canadian exports. Forest products, petroleum and natural gas, minerals, and basic metals accounted for 65% of Canada's total merchandise exports in 1960, 47% in 1970 and 36% in 1984. Much of the decline from 1960 to 1970 was caused by growth in exports of automotive products facilitated by the 1965 Automotive Agreement with the United States. More recently, the primary causes have been the slow growing global demand for resource products and increasing foreign competition.

Focusing on secondary manufactures, automotive products' share of

Canadian exports have fluctuated significantly, but averaged about 23% over the past two decades. Meanwhile, other secondary manufactures' share increased from 15% in 1960 to 19% in 1970 to about 25% in recent years. This trend reflects a strengthening of Canadian comparative advantages (or a lessening of its comparative disadvantages) in manufacturing. Like the United States, a decline in the importance of traditional Canadian export activities portends a more balanced economy and greater apparent self-sufficiency in manufacturing.[22]

Nevertheless, Canadian manufacturing faces many of the same tough challenges confronting U.S. manufacturing. Canada must expand its R&D infrastructure more rapidly to meet the Japanese challenge, and it must enhance and expand the application and dissemination of technology to improve productivity in the face of growing competitive challenges from the NICs. Two sets of factors make these tasks especially difficult for Canada.

First, in response to the Tokyo Round tariff cuts, rationalization of Canadian manufacturing has continued, but Canadian productivity remains about 30% below U.S. levels.

Second, Canada's strong advantages in natural resources helped encourage a pattern of manufacturing development away from knowledge-based industries toward the more capital-intensive, resource-based manufacturing. Canada's proportionately smaller presence in technology-intensive activities historically, and consequent smaller R&D infrastructure, makes it harder for Canada than for the other major AICs to put greater emphasis today on high-technology exports.

V. Strengthening North American Manufacturing

The trends discussed above indicate U.S. and Canadian competitive performance in manufacturing will improve. The critical question is how? Through a continuous decline in the U.S. and Canadian dollar exchange rates or through leadership in product innovations and increased productivity growth?

A. Investing in R&D

In high-technology industries, the need for more R&D investment in the face of growing Japanese and European efforts is apparent. Among the AICs listed in Table 10, Canada has the fewest scientists and engineers working in research. However, as Canadian businesses undertake more R&D and seek to export more state-of-the-art machinery, electrical equipment and other technology-intensive manufactures and

[22] "Apparent" self-sufficiency has increased since the 1960s in the sense that although the share of Canadian consumption of manufactures supplied by imports within individual industries remains high, the ratios of Canadian shipments and exports to consumption have grown.

services, Canada's universities will have to significantly expand their capacity to train scientists and engineers.

The United States spends 2.8% of GNP on R&D, about as much as its principal rivals, Germany and Japan, and more than other AICs. However, the impact of federal policies on the commercial benefits derived from these efforts is a critical public policy question. About half of U.S. R&D spending is government financed: a much larger share than in Japan and Germany.

Table 11: R&D Spending as a Share of GNP, 1985

	Public	Private	Defense	Nondefense	Total**
United States	1.4%	1.4%	0.9%	2.0%	2.8%
Japan	0.6	2.2	*	2.8	2.8
Germany	1.0	1.7	0.1	2.5	2.7

* Less than one-half of 1%.

** Defense and nondefense may not equal total due to rounding.

Source: OECD SCI. AND TECHNOLOGY INDICATORS DATABASE.

U.S. Government-sponsored research is primarily mission oriented, justified in terms of broad societal objectives rather than in terms of commercial benefits or the advancement of science.[23] U.S. federal funds are generally not used to promote coordination of private R&D efforts that might accelerate the development of new products.[24]

Government-funded R&D does raise the productivity of private financed R&D; however, the commercial benefits can accrue to foreign as well as U.S. firms. Although the commercial benefits are more likely to accrue to U.S. firms than to foreign firms, public R&D generates fewer competitive benefits exclusively for U.S. firms than does privately financed R&D.

The competitive consequences of greater U.S. emphasis on public, noncommercial and semicommercial R&D may be exacerbated by the large defense component of federal spending. Defense-related R&D has led to major commercial applications in many industries, including semiconductors, computers and commercial aviation. However, as high-technology industries mature, defense and commercial applications tend to diverge. In recent years this has limited, though not eliminated, the com-

[23] This is in sharp contrast with many Japanese and European Government efforts, such as MITI's programs in computers, new materials and fiber optics, and European support for Airbus, Esprit and Eureka. There have been important exceptions. For example, in the computer sector, where threatened loss of commercial leadership has been interpreted as potentially impairing the U.S. defense industrial infrastructure, the U.S. Government has sometimes responded, e.g., the Very High Speed Integrated Circuit Program, in 1978. K. FLAMM, TARGETING THE COMPUTER, GOVERNMENT SUPPORT AND INTERNATIONAL COMPETITION (1987).

[24] The Microelectronic Computer and Technical Corporation that brings together several computer and electronics companies, and President Reagan's proposed program for superconductors are examples of exceptions to the rule.

mercial applicability of defense research. Also, cumbersome U.S. screening and licensing procedures for exports of defense-related merchandise can reduce the commercial benefits derived by U.S. firms when complementarities are present between defense and civilian applications, but the United States does not have a monopoly in products subject to controls.[25] This discussion is not intended to be an argument against defense R&D; rather, the thrust is that defense R&D should not be expected to substitute for nondefense, commercial R&D on a dollar for dollar basis.

With Japan and Germany spending about the same share of GNP on R&D as the United States and with larger shares being financed by their private sectors and for nondefense purposes, these competitors may be expected to obtain more competitive benefits from their R&D spending than the United States. In the United States, private commitments to R&D have been growing steadily in recent years and this must continue for U.S. competitive performance in high technology to improve.

Although adequate R&D investment and product innovation are critical to strengthening high-technology industries, the diffusion of new technologies, as well as the effective organization of manufacturing and management of human resources to take full advantage of these, are critical to improving productivity across the full range of manufacturing. These are emerging as problem areas for U.S. manufacturing and hence for their Canadian subsidiaries.

B. Diffusion of New Technology

North American manufacturers appear to be implementing new automation and flexible manufacturing technologies more slowly than their Japanese competitors. Lower levels of U.S. and Canadian investment in new machinery and equipment are a general indicator of this lag. Industry studies find U.S. firms lagging behind competitors in Japan, Sweden, and West Germany in the adoption of innovations such as robotics and computer numerically controlled ("CNC") machines.[26] Jaikumar estimated in 1986 that over the previous five years Japan outspent the United States on automation by two to one.[27] Forecasts of the number of flexible manufacturing systems that will be installed by 1990 reveal a significant lag in the United States (see Figure 3).

Rapidly advancing technological capabilities in Japan and some European countries have shortened or eliminated U.S. leads in many industrial activities, and the diffusion of technology among countries appears

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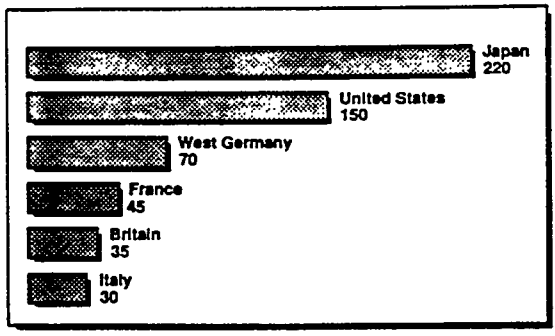
[25] In 1987, a Joint Committee of the National Academy of Sciences, the National Academy of Engineers, and the Institute of Medicine found U.S. export review procedures to be longer in the United States than elsewhere. PANEL ON SECONDARY SCHOOLS AND THE WORKPLACE, COMMITTEE ON SCI. ENGINEERING & PUB. POL'Y, HIGH SCHOOLS AND THE CHANGING WORKPLACE: THE EMPLOYER'S VIEW (1984).

[26] K. Flamm, THE CHANGING PATTERN OF INDUSTRIAL ROBOT USE; D. Mowery, THE DIFFUSION OF NEW MANUFACTURING TECHNOLOGIES (1986).

[27] Jaikumar, *Postindustrial Manufacturing*, HARV. BUS. REV. 69-76 (Nov.-Dec. 1986).

Figure 3
Estimated Number of Flexible Manufacturing Systems in Use by 1990



Source: Valery, *Factory of the Future*, ECONOMIST 10 (May 10, 1987) (reprinted by permission).

to be accelerating. Although foreign innovations are now an important potential source of new production processes, the National Academy of Sciences Panel on Technology and Employment[28] found that U.S. firms "do too little to gain access to foreign science and engineering research, despite the importance of these offshore' sources of commercial technology." The panel believes "it imperative that U.S. firms emulate those of other nations, such as Sweden and Japan, and monitor the international technological environment assiduously to remain abreast of new developments and research."[29]

C. *Restructuring Manufacturing*

New technologies can strongly influence "best practices" for the organization of corporate functions. For example, in implementing computer-integrated production, Deere and Company achieved large savings by redesigning a single component so that it could be used in eight different lawn and garden tractors. At IBM, desktop printers, redesigned for assembly with automated equipment, can be manually assembled in less than three minutes.[30] Westinghouse officials estimate that up to 25% of the gains from automation can come from merely redesigning products for easy assembly, apart from actually installing the automation machinery.[31] However, this integration of design and production engineering

28 *Id.*

29 *See generally* TECHNOLOGY AND EMPLOYMENT: INNOVATION AND GROWTH IN THE U.S. ECONOMY, (R. Cyert & D. Mowery eds. 1987) (this reflects the conclusions of the Panel on Technology and Employment).

30 *Id.*

31 Sadlow, *New Strategies for Industrial Success*, LOOKING AHEAD 6-11 (Summer 1967).

systems, which traditionally have been in separate departments, often entails major organizational changes.

More broadly, computer-integrated manufacturing seeks to coordinate many functions (marketing, product specification and design, fabrication and assembly with flexible manufacturing systems, materials purchasing, and inventory control) to facilitate quick, flexible responses to changing customer requirements. Efficient use of these systems requires that decisions "once made by people in functions that were relatively independent must now be made jointly."[32]

The organization of North American companies has been heavily influenced by the production line approach to manufacturing, adopted early in this century. Firms usually had a strong central management. Professionals were compartmentalized by function, e.g., product development, production engineering, strategic planning, marketing, public relations, and purchasing. For blue collar workers on the line, efficient manufacturing emphasized breaking down tasks into a series of relatively unskilled, repetitive, activities. Production workers were not encouraged to take initiative, (fix problems as they arose). Engineers and managers bore the responsibility for refining and perfecting processes to assure efficient production and product quality, and for avoiding breakdowns on the production line.[33]

Effective implementation of computer-integrated technologies usually requires collapsing serial functions into a nearly simultaneous process. As in the combining of design and manufacturing engineering, the integration of processes can be productive quite aside from the actual installation of the new equipment.

The implications for blue collar workers are important. Many traditional responsibilities of supervisors, such as planning, scheduling work, and diagnosing problems, will be taken on by assembly workers in "work teams." Often with new or rapidly evolving systems, engineers cannot fully anticipate potential problems. Assembly workers are in a key position to recognize them before machines shut down, avoiding expensive delays, and to advise management in the design and purchase of equipment. As workers take on these responsibilities, they need better basic skills and more technical training and retraining. For example, GM's new front axle plant in Saginaw, Michigan, will be run entirely by robots part of each day. It will be operated by forty UAW workers with about a year of training in electrical, mechanical and problem-solving skills.[34] This amount of training is relatively uncommon in the United States but

[32] NAT'L RES. COUNCIL, HUMAN RESOURCE PRACTICES FOR IMPLEMENTING ADVANCED MANUFACTURING TECHNOLOGY (1986).

[33] For a more detailed discussion, see NAT'L ACAD. OF SCI., TECHNOLOGY AND EMPLOYMENT: INNOVATION AND GROWTH IN THE U.S. ECONOMY (1987).

[34] Hoerr & Pollock, *Management Discovers the Human Side of Automation*, BUS. WK, Sept. 29, 1986, at 70-75; SAGINAW DIVISION PRESS RELEASE (Nov. 1987).

not in Japan.[35]

The Westinghouse furniture systems factory in Grand Rapids, Michigan, is a good example of the synergism that can be achieved between computer-assisted manufacturing and work team organizations. Worker participation ranges from discussions of overall business strategy to the design of work areas. Using computer-aided design and manufacturing, workers move from one special order to another, using standardized parts in many different products. The plant functions more like a quick-response service establishment than a traditional factory.

> Shop floor workers consult frequently with customers who phone or visit the factory to check on the progress of their orders. As in a top-quality French restaurant, everything is aimed at pleasing the customer, including high product quality and short delivery time. Michael Maccoby, a pioneer consultant on work reform, says the Westinghouse plant is a leading example of a "technoservice" mode of production that is replacing the old "industrial bureaucracy" systems that crank out unvarying, mass-produced items.[36]

From 1983 to 1986, productivity at the Westinghouse plant rose 74%.

Despite the potential benefits of combining changes in organizational structures, greater worker participation and training, and new manufacturing systems, U.S. industry may be too slow in recognizing the need to reorganize work processes.[37] Companies seeking to combine new technologies and work practices often encounter cultural resistance from managers. They are reluctant to "run the kind of social revolution at work that is needed to make technology pay for itself," according the head of the Manufacturing Studies Board at the National Academy of Sciences.[38] Japanese competitors are more comfortable with such managerial innovations. Nevertheless, North American models for how to combine "best practices" management and organization with state-of-the-art technology are emerging.

At Westinghouse, the installation of computer-integrated manufacturing equipment is preceded by a program of manufacturing process strategic planning.[39] Key steps include:

- Examining employee functions throughout the business, assessing how these will change and communicating the needed changes to employees.

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[35] In a study of flexible manufacturing systems, it was found that 40% of the workforce in Japanese companies were college trained engineers, and all had training in the use of CNC machines. Only 8% of the U.S. employees were comparably trained engineers, and less than 25% had been trained in CNC machines. Jaikumar, *supra* note 27.

[36] Hoerr, *Getting Man and Machine to Live Happily Ever After*, BUS. WK, Apr. 20, 1987, at 61-62.

[37] *See supra* note 28.

[38] Hoerr & Pollock, *supra* note 34.

[39] Sadlow, *supra* note 31.

• Educating all employees about how the business works and how design and manufacturing processes need to run to be efficient.

• Integrating key functions — tearing down institutional walls between design and manufacturing engineering and business systems to create totally integrated product development teams.

Other companies making important productivity gains include Procter & Gamble, Xerox, and Rohm & Haas.

VI. Policy Agenda

The competitiveness challenge, as defined by the President's Commission on Industrial Competitiveness and articulated by other private-sector groups, emerged from forces that have been building for many years. If the challenge is defined as matching the growth of imports with exports while providing the basis for maintaining and expanding real incomes, the task requires efforts on many fronts. The immediate challenge is to restore current account equilibrium. Over the long-term, structural problems, in particular, lagging productivity growth and adjusting to changing comparative advantages, require attention.

During the early and mid-1980s, rising federal budget deficits greatly distorted U.S. patterns of consumption, production and trade. Inflows of foreign capital and an overvalued dollar facilitated unsustainably high incomes and consumption fed by imports. Import-competing and export-oriented industries were priced out of their traditional markets.

From 1981 to 1985, the Canadian dollar, although depreciating somewhat against the U.S. dollar, followed the U.S. currency up against European and some other currencies. This improved the price competitiveness of Canadian exports in U.S. markets but weakened it elsewhere.

Since 1985, the effective exchange rate of the U.S. dollar has returned to its 1980 level and some progress has been achieved in curbing federal deficits. However, the decline of the dollar has been uneven, falling sharply against the yen and German mark but not as much against the currencies of the Asian NICs. Although recent expansionary policies in Japan are encouraging, increased Japanese consumption has not translated into large enough imports of U.S. products, and European growth prospects remain disappointing. More progress in curbing U.S. budget deficits and more expansionary policies in Japan and Europe will be required to restore current account equilibrium.

Even in the event an appropriate constellation of U.S., Japanese and European macro policies is achieved, the effective exchange rate for the dollar that would balance the U.S. current account is lower than a decade ago. Among the reasons are:

• U.S. productivity growth has continued to lag behind many competitors.

• More exports will be required to service the external debt.

- In 1980, the major debtor countries absorbed a quarter of U.S. exports. Now many of these countries have dramatically cut their current account deficits until their financing problems are resolved.
- U.S. export prospects in agriculture and high technology have been curtailed by the emergence of new suppliers.
- As long as the fall of the U.S. dollar remains uneven, the sourcing of products from countries with strong currencies (e.g., Japan and Germany) can be moved to countries that have experienced only modest appreciation in their currencies against the U.S. dollar (e.g., Taiwan and Korea). Also, manufacturers in Germany and Japan can increase purchases of components from these sources to maintain price competitiveness in the U.S. market.

Focusing on the composition of the current account deficit, manufactures are the component that deteriorated the most in response to the appreciation of the dollar.

Table 12: Components of U.S. Current Account Balance (Percent of GDP)

	1969	1979	1986	Change 1979-1986
Current Account Balance	.04%	− .04%	3.36%	−3.32%
Merchandise Trade				
Manufactures	.18	.17	−2.65	−2.82
Nonmanufactures	−.12	−1.29	− .79	.50
Investment Income	.63	1.26	.50	− .76
Services				
Travel and Transportation	−.18	− .12	− .24	− .12
Royalties and Fees	.19	.22	.14	− .08
Finance, Insurance and Other Professional Services	—	.02	.13	.11
Transfer Payments	−.66	− .30	− .45	− .15

Source: SURVEY OF CURRENT BUSINESS (various issues).

From 1979 to 1986, the balance on the current account deteriorated by 3.3% of GDP, with the balance on manufactures falling over 85% of that amount — 2.8% of GDP. As the U.S. economy adjusts to a lower dollar, manufactures can be expected to respond most, because it is the component of the current account that is most sensitive to the price changes imposed by a weaker dollar.[40]

[40] This analysis of the current account is patterned on Krugman & Hatsopoulos, *The Problem of U.S. Competitiveness in Manufacturing*, NEW ENG. ECON. REV. 18-29 (Jan.-Feb. 1987). They choose as base years 1969, 1973 and 1979, because these were the peaks of previous business cycles. Alternatively, the 1986 deficit could be compared to 1981, the last year of current account equilibrium, with very similar results. From 1981-86, the current account balance deteriorated 3.6% of GDP, with the balance on manufactures falling to 3.3% of GDP.

The *investment income* balance is principally determined by the long-term buildup of U.S. direct investments abroad and foreign direct investments in the United States, and by movements in the portfolio investments (corporate and government bonds, securities, etc.). In the third quarter of 1987, it became negative; and as the United States continues to mount up external debt, this component will continue to deteriorate.

In *services*, travel and transportation are most sensitive to exchange rate movements, but a reduction of the deficit in this category to its 1979 levels would amount to less than 4% of the total current account deficit. Royalties and fees have been the slowest growing component of service exports. The balance on finance, insurance and other professional services has improved; however, these industries account for about 3% of all export receipts. Even if the latter two components of the current account doubled, the improvement would do little more than compensate for the continued deterioration in the investment income balance.

Focusing on *merchandise trade*, the two key items in nonmanufactures are petroleum imports and agricultural exports. The former are priced in dollars and will not be greatly affected by recent exchange rate movements. However, to the extent that foreign oil prices rise slightly to reflect a cheaper dollar, the contribution of this item to changes in the current account will be negative. Prospects for agricultural exports indicate only limited recovery. Even if the agricultural exports surplus rose to its 1981 peak, a doubtful occurrence, the impact on the current account would be about 15% of the current account deficit.[41]

Therefore, if the current account deficit is going to be brought down, the manufacturing trade deficit will have to decline dramatically. Over the next several years, two factors should dominate the general outlook for U.S. manufacturing. First, the weaker dollar is increasing the demand for U.S. exports and reducing American appetites for imported goods. Second, increasing competition in agriculture, high technology and services portends a tilt in the competitive balance in favor of mature manufacturing activities and some resource-based activities. A weakening of U.S. comparative advantages in some sectors should be accompanied by better prospects elsewhere.

For Canada, a weaker U.S. dollar means a weaker Canadian dollar against the yen and European currencies. In Europe and Japan, Canadian resource exports will fare better. Nevertheless, the secular trend toward less reliance on agricultural and natural resource-based products and an increased share for nonautomotive secondary manufactures in Canada's exports should continue. Other things being equal, the U.S. share of Canadian exports would be expected to decline with a weaker U.S. dollar, but the pull of free trade would ameliorate this trend.

[41] Even if the volume of exports were to recover their 1981 levels, these sales would be at lower inflation-adjusted prices.

The important issue for both the U.S. and Canadian economies is not whether or not manufacturing will survive. Rather, the critical question is whether North American manufacturing will be able once again to lead in innovation and achieve more rapid productivity growth, or will a continuous secular decline in the U.S. or Canadian dollars and living standards relative to other AICs be required to restore and maintain a balance between the growth of exports and imports? Achieving the former will require:

- more investment in new plant and equipment — in the United States, to bring the pace of introduction of new technologies closer to rates in Japan; in Canada, to speed the rationalization necessary in many industries to bring productivity up to U.S. and world levels.
- more emphasis on human resource development, especially worker training and involvement in planning and implementing automation, and more attention to effective corporate and manufacturing organization.
- increased efforts to monitor and adopt foreign technological innovations.
- more investment in private, commercial R&D. Efforts are needed to ensure cooperation between public and private researchers. The consequences of the large U.S. commitment to publicly financed R&D need to be examined to ensure that commercial benefits are not needlessly constrained.

Focusing on public policies to achieve these goals, it is important to recognize that the progress of both the U.S. and Canadian economies is ultimately determined by the responses of firms and workers to market opportunities. Governments can encourage particular activities, tipping the scales to maintain employment or increase investment in some industries or regions. However, the ability to sustain competitiveness, free of permanent government assistance, is firmly rooted in the entrepreneurial and technological adroitness of domestic firms, the prices they must pay for capital, various types of labor and other resources, and the scope of domestic and foreign market opportunities.

Generally, providing long-term protection for firms that are uncompetitive owing to inadequate rates of assimilation of new technology, ineffective approaches to the management of technology and human resources, or the payment of high prices for labor or other resources is not the best way to encourage firms to become more agile and responsive, or to restore equilibrium to markets for productive resources. The more promising approach is to encourage managers to be sensitive to the consequences of changes in international market conditions and technological environments, to provide them with adequate supplies of capital and skilled labor, and to assure them reasonable access to foreign markets.

Increasing investment begins with the cost and availability of capital. U.S. savings rates seriously lag behind those in other countries and

federal deficits drain these limited resources, increasing interest rates and dependence on foreign borrowing. The misalignment of the U.S. dollar, and hence the Canadian dollar, vis-à-vis several newly industrializing countries limits market opportunities and discourages investment in modernization and new equipment. In Canada, savings performance is better, but its small domestic market, coupled with the threatened loss of access to the U.S. market, has encouraged Canadians to seek investment opportunities in the United States.[42] The bilateral trade agreement will make investment in Canadian manufacturing more attractive.

Ultimately, business R&D spending is an investment in intellectual capital (i.e., marketable products and patents), and increasing the availability and reducing the cost of capital is important for stimulating these efforts. Equally important, business efforts to increase R&D need to be accompanied by a faster growing supply of university-trained scientists and engineers. Despite its population of less than half the size, Japan graduates about the same number of engineers as the United States and Canada combined, lowering its R&D costs. Similarly, the advent of more sophisticated manufacturing processes with greater responsibilities for production workers makes the quality of basic skills education received by the general workforce important for improving productivity, and for diffusing and assimilating new ideas and process quickly and effectively. In the United States, several major studies[43] have indicated the need to improve the basic skills of new workers and the qualifications and training of teachers. Improvements in science and mathematics literacy, numerical reasoning, problem solving skills, reading, and written communications appear critical. Special emphasis is required at the primary and secondary levels on increasing the amount of science and mathematics taught and the pool of qualified teachers.

Domestic policies to improve competitiveness will be most effective if complemented by efforts to improve the functioning of the international financial system and market access abroad. With respect to exchange rates, efforts to achieve more stability should bring the Asian NICs into the process of exchange rate adjustment and policy coordination. With respect to trade negotiations, efforts to improve market access for North American services and high-technology products, as well as to reform agricultural support programs, are important.

The next President faces the challenge not only of balancing the budget but also of building a national consensus that a broad approach is

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[42] A. RUGMAN, OUTWARD BOUND: CANADIAN DIRECT INVESTMENT IN THE UNITED STATES (1987).

[43] NAT'L COMMISSION ON EXCELLENCE IN EDUCATION, A NATION AT RISK: THE IMPERATIVE FOR EDUCATIONAL REFORM (1983); PANEL ON SECONDARY SCHOOLS AND THE WORKPLACE, COMMITTEE ON SCI. ENGINEERING AND PUB. POL'Y, HIGH SCHOOLS AND THE CHANGING WORKPLACE: THE EMPLOYER'S VIEW (1984); TASK FORCE ON TEACHING AS A PROFESSION, CARNEGIE FORUM ON EDUCATION AND THE ECONOMY, A NATION PREPARED: TEACHERS FOR THE 21ST CENTURY (1986).

necessary to improve and sustain productivity growth and competitiveness. A comprehensive program of policy reforms and legislation that will win support both in Congress and among business and labor leaders must be developed, as well as the respect of governments and businesses abroad must be achieved.